

WOMEN'S HEALTH: BEYOND OB/GYNE

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INTRODUCTION

We are in the midst of a medical revolution. Biomedical research is finding that women experience health and disease differently ... *normally* ... from men. During the past decade there has been a growing momentum to incorporate these findings into medical research and practice.

Medicine is finally catching up with human biology. There has been a growing body of research that demonstrates an astounding array of facts about women's physiology. This research in almost every example supports the saying that one should never assume anything. The inclusion of women in biomedical studies has already given us profound enlightenments about sex differences beyond the so-called "bikini view." It will affect how medicine is practiced for both women and men. Whether as information providers or patients, our mindsets about what normal responses to disease and to health will change. This essay provides examples of sex-based biomedical research findings, followed by resources for gender-based medicine information to assist librarians and other information providers in delivering services and resources for evidence-based patient care.

EXAMPLES OF GENDER-SPECIFIC BIOMEDICAL DIFFERENCES

The following are examples of gender-specific differences that reflect the extraordinary knowledge that is coming from biomedical research. Drawn from research related to the brain, the cardiovascular system, and medications, these examples demonstrate the way developing knowledge is changing perspectives in medical practice.

Brain

The brains of women and men differ in a number of ways: structurally, functionally, and behaviorally. For some tasks, different parts of the brain may be used by women and men. For example, the left side of the brain is used by women and the right side of the brain is used by men to do the same verbal memory tasks; women's

reaction time is slower but more precise (Garnett, 2003, para. 5). Men have larger and heavier brains, and women have smaller and lighter brains (de Courten-Myers, 1999, p. 217). Women have more gray matter tissue and less white matter than men, which "is a reasonable evolutionary strategy because smaller crania require shorter distances for information travel, hence there could be relatively less need for white matter" (Gur, & Gur, 2004, p. 65-6). Despite these size differences, no differences in intelligence tests have been found between men and women (de Courten-Myers, 1999, p. 218).

Women have larger orbital frontal lobes than men when measurements are adjusted for intracranial volume (Gur, & Gur, 2004, p. 66). This area of the brain is involved with social behavior, emotional functioning, reasoning, and decision-making (Gur, & Gur, 2004, p. 66). Women's agility with verbal and memory tasks, and men's aptitude for spatial tasks can somewhat be explained by some of these anatomical differences, as well as the tendency for certain brain disorders to occur and/or present differently in women and men. For instance, women are more likely to suffer from depression and anxiety disorders, and men are more likely to have autism and attention deficit hyperactivity disorder (ADHD) (National Institute for Mental Health [NIMH], 2001). While men are more likely to drink alcohol and to drink more of it, women who drink are more likely to become impaired and to develop organ damage even with lower levels of consumption over a shorter period of time (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2004, [Intro.]). These differences are partially accounted for by the fact that alcohol is processed differently by women and men. For instance, alcohol intake in women produces higher peak blood alcohol concentrations; the nervous system and other systems in a woman's body are exposed to higher concentrations of alcohol for the same amount of alcohol ingested per pound due to women's lower body water content; and women have significantly less metabolism of alcohol in the stomach (first pass metabolism) than men which results in less of the alcohol being metabolized and more being absorbed directly (Greenfield, 2002, p. 78-79).

In some instances, there are differences in the amounts of the same biochemical that are produced. "For example, men produce 52 percent more of a hormone needed to prevent depression (serotonin) than women;" and since nearly twice as many women have depression as men, biochemical production may be part of the explanation for women being more prone to depression (Legato, 2002, p. 13, 37). The response to lower serotonin levels is also different: women are inclined to withdraw and become anxious, and men become aggressive and self-medicate with alcohol (Legato, 2002, p. 13).

Hormones also contribute to verbal and spatial task performance. Estrogen has been noted to have an effect on brain neurotransmitters; fluctuations of the hormone appear to cause changes in cognitive functions, such as improvement in memory and verbal fluency when levels of estrogen are high and progesterone are low (Legato, 2002, p. 64). Spatial performance has been shown to improve in women during a woman's period when both estrogen and progesterone levels are their lowest (Legato, 2002, p. 64). One study found that women scored higher on spatial tests during the menstrual cycle related to higher testosterone levels during that time of the cycle (Hausmann, Slabbekoorn, Van Goozen, Cohen-Kettenis, & Güntürkün, 2000, p. 1248-1249).

Numerous studies have demonstrated a connection between pain perception and estrogen levels in women (Marcus, 2004, p. 129; Hamilton & Parry, 1983, p. 129). As estradiol levels increase, neuronal synaptic density increases as well as an increase in neurotransmitters that inhibit pain (Hamilton & Parry, 1983, p. 129). Exactly how and what estrogen receptors (ER) mediate brain responses has not been found.

Cardiovascular

The normal heart muscle is made up of contractile proteins, and the muscle cells and fibers are held together by a fiber-like framework. Women have more of this fiber-like framework which as they age gets increasingly stiff, affecting the expansion of the heart between heartbeats. This stiffness is more frequent in women with hypothyroidism, a condition that affects women more often than men (Legato, 2002, p. 95).

There are estrogen receptors in vascular smooth muscle cells, including the myocardium, which are sensitive to estrogen levels. When estrogen levels fluctuate drastically or drop suddenly (such as right before a woman's period and during pregnancy, postpartum, and peri-menopause) palpitations and tachyarrhythmia's may result (Legato, 2003, p. 10-11; 4woman.gov, 2004, para. 3).

A very important difference that needs to be acknowledged by medical and lay people alike is the

fact that women may exhibit symptoms during a heart attack that men do not exhibit. Signs and symptoms of a heart attack for women can be "pain or discomfort in the center of the chest; pain or discomfort in other areas of the upper body, including the arms, back, neck, jaw, or stomach; and other symptoms, such as a shortness of breath, breaking out in a cold sweat, nausea, or light-headedness" (4woman.gov, 2005).

Medications

There is research concerning sex differences in drug absorption, distribution, metabolism, and elimination since the late 1960's. There have been calls for research and incorporation of research findings about sex differences in drug pharmacokinetics since at least the early 1980's (Hamilton & Parry, 1983, p. 130). Integration into medical practice has been nearly nonexistent. Research on oral contraceptives, hormone replacement therapy, and other medications (including ibuprofen) demonstrated dose-related adverse effects typically felt by a greater percentage of women than men (Cohen, 2002, p. 105-108). These adverse affects can many times be ameliorated by reducing the dose without compromising effectiveness (Cohen, 2002, p. 106).

Research is revealing that women and men can react differently to the same medication; sometimes the difference can be a life-threatening one. For instance, it has long been known that women have differences in their heart electrophysiology as revealed by electrocardiogram (ECG) readings. This physiological difference makes women more susceptible to *torsades de pointes* (TdP), a potentially lethal drug arrhythmia, when taking some drugs (such as certain antiarrhythmics, antihistamines, and antipsychotics) (Rosen & Pham, 2004, p. 241-242). Women and men can also have differences in how the same drug is metabolized. One example is diazepam, more commonly known as Valium. Diazepam is metabolized forty percent more quickly in women than men, and thus may require larger doses to get the same effect in women as men (Legato, 2002, p. 61).

There are a number of physiological variables that can influence the absorption of drugs. Unsurprisingly, the menstrual cycle, birth control pills, and hormone replacement therapy (HRT) can affect drug pharmacokinetics which needs to be taken into account when prescribing medication for women. Another variable that common sense tells us, but has not typically been taken into account when prescribing medication, is how big a person is. Yes, indeed, research is showing that "Size does matter" (Schwartz, 2004, p. 825). The smaller a person is, the less volume there is for the drug to distribute which effects concentrations (Schwartz, 2004, p. 826). Not only does size matter, but the type of body composition matters. The more fat that a person has can be a factor for how much and/or how long a fat-

soluble drug is absorbed and maintained in the body (Schwartz, 2004, p. 826; Chue, 2004, p. 145). There are also sex variations in how the liver and kidneys clear the same medications out of the body (Schwartz, 2004, p. 826-827).

SELECTED RESOURCES IN GENDER-SPECIFIC BIOLOGY AND MEDICINE

The titles discussed below are among the many important contributions to the knowledge and understanding of gender-specific biology and can be considered core titles for collections on the topic. Selected organizations and web resources are also explained.

Dr. Marianne J. Legato is a prolific author and tireless advocate for gender-specific medicine with numerous books and articles on the subject. She founded the first center dedicated to gender-specific medicine, The Partnership for Gender-Specific Medicine at Columbia University, in 1997. She is editor of *Principles of Gender-Specific Medicine*. This reference work provides comprehensive review summaries with extensive bibliographies of current research regarding gender-based biology and clinical medicine in the areas of development, central nervous system, cardiology, pulmonology, gastroenterology, reproductive biology, oncology, nutrition, drug metabolism infectious disease, bone, immunology/rheumatology, and aging. Any institution or practitioner serious about doing gender-specific medicine will not be without access to this title.

Our Bodies, Ourselves: A Book by and for Women was one of the first self-help books. Back in 1969 a group of women in Boston who were frustrated with the medical system got together to learn more about their bodies, things that were not available to them from conventional medical sources. They advocated for women to become more knowledgeable about their bodies through professional sources and each other, and to take an active role in decisions about their medical care. They are considered by many as the ones who launched the modern women's health movement that culminated in women's health as we know it today. The Collective lives on. A new edition of *Our Bodies, Ourselves* has been published in 2005, with a companion web site at <http://ourbodiesourselves.org/book/default.asp> (Our Bodies, 2005).

Gender Medicine: the Official Journal of the Partnership for Gender-Specific Medicine at Columbia University is an imprint of Excerpta Medica, an Elsevier business, which "focuses on the impact of sex and gender on normal human physiology and the pathophysiology of disease" (Gender, 2005). The Partnership's official journal from 1998 through 2003

was the *Journal of Gender-Specific Medicine* which was published by MultiMedia HealthCare/Freedom, LLC (MMHC) [Note: MMHC was acquired by HMP Communications, LLC in August of 2004]. (Journal, 2004). In 1999 Mary Ann Liebert, Inc. transitioned their publication, *Journal of Women's Health*, into *Journal of Women's Health & Gender-Based Medicine*, but in 2002 returned the title to its former name, *Journal of Women's Health* with a focus on health issues that are more common among women.

The Center for Gender-Specific Medicine at Jewish Hospital Medical Center East in Louisville, Kentucky is the first medical center in the world, with the assistance of Dr. Marianne J. Legato to implement gender-specific medicine principles throughout the institution for diagnosis and treatment, including the use of gender-specific diagnostics such as 12-lead cardiac monitoring equipment with gender-specific algorithms which is in every patient room and treatment area. The Center's web site has information about its commitment to gender-specific medicine and its implementation in their patient care. The Center provides gender-specific information about selected medical conditions.

A number of other web sites are on this list that link to gender-specific biology research information. Medicationsense.com is a site owned and maintained by Dr. Jay S. Cohen, Associate Professor of Family and Preventive Medicine and of Psychiatry, University of California at San Diego. Dr. Cohen advocates for better, safer methods of providing medications, including using the safest, lowest dose. He has written numerous articles that are indexed in PubMed (MEDLINE). Although the *For Women: Preventing Side Effects in Women* web page is a general overview, it does include citations for publications, such as "Do Standard Doses of Frequently Prescribed Drugs Cause Preventable Adverse Effects in Women?" This article explains incontrovertibly why it is important that medication dosage be tailored to women's biology, which fits with results on gender-specific research relating to women and medications.

Government agencies responsible for seeing that women are included in biomedical clinical research are the NIH Office of Research on Women's Health (ORWH), which oversees gender-based research throughout the NIH, and the FDA Office of Women's Health (OWH).

The Society for Women's Health Research was founded in 1990 to advocate for the inclusion of women in research to learn about sex differences exhibited in disease and affecting health. There are excellent scientific fact sheets on the sex differences for several diseases and conditions on the society's Web site.

CLOSING

Biomedical research is identifying sex differences in how we experience wellness and illness. There are profound implications for understanding how women and men physiologically experience disease processes, and normalcy. To provide truly evidence-based information to health care professionals and consumers, information professionals must become acquainted with gender-specific medicine and resources. By doing so, we are not only helping our patrons, but ourselves.

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